On-Site Solvent Recovery Stills

Background on the Distillation Process

Stills are equipment used in the distillation of chemical mixtures. Distillation is a separation process that requires that the components of a mixture possess unique boiling points. The two basic steps of distillation are vaporization and condensation.

Vaporization involves heating the mixture to the boiling point of the solvent desired until the liquid becomes a gas. By controlling the temperature of vaporization it is possible to selectively recover one or more solvents from a mixture. For solvents that have a high boiling point, the solvents are distilled at reduced pressures (sometimes near vacuum) to lower the temperature needed to boil the solvent. This process, vacuum distillation, requires additional equipment.

During condensation, the vapor, known as the overhead product, is passed through a cooling system called a condenser where the vapor is condensed to a liquid product. The remaining material in the still, referred to as the still bottoms, must be disposed of as hazardous waste.

Applications of Solvent Recovery Stills

Small quantity generators of solvent waste frequently use batch processing in 'kettle' type stills to recover their solvent waste. Batch process distillation involves feeding the waste to the still in a batch. No additional solvent waste can be added to the system until the original batch is completed.

Batch stills are frequently used for solvent recovery in the following settings:

- **Autobody Repair:** to recover paint thinner
- **Automotive Repair:** to recover parts cleaners
- **Drycleaners:** to recover drycleaning solvent

Large quantity generators of solvent waste use continuous distillation systems as opposed to batch systems. Continuous systems are those which continuously are fed waste solvent and likewise continuously produce the recovered solvent. Continuous stills are able to recover large amounts of solvent faster than batch stills. However, continuous stills require that large amounts of solvent waste be fed to it in order to be cost effective.

Continuous stills are frequently used in solvent recovery in these settings:

- **Chemical Manufacturing**: to recover solvent by-products
- **Paint Stripping:** to recover dirty paint strippers
- **Parts Degreasing:** to recover degreasing solvents

Purchasing Guidelines for On-Site Solvent Recovery Stills

The following list of equipment purchasing considerations was developed by the Wisconsin Department of Natural Resources to help Wisconsin businesses identify and evaluate current hazardous waste minimization opportunities. Although it is not possible to cover every aspect of equipment selection, the list covers some of the more important points and provides considerations for evaluating solvent recovery stills.

Is a still a feasible method for your company to recycle its solvent waste?

1. Is the solvent to be reclaimed a pure solvent or a solvent blend? *[A blended solvent frequently yields a distillation product that differs in composition from the solvent fed to the still]*
2. Are there components found in the distilled solvent that will make it unsuitable for use in its original capacity?
3. If the distilled product is not suitable for its original use, is there another use for the solvent in your facility?
4. Will it be possible to implement a waste segregation policy in your facility? *[Preventing the mixing of waste*

solvents is essential in developing an effective solvent recovery program.]

5. Does the solvent that you use contain Nitrocellulose? *[Nitrocellulose is found in some inks and lacquers; it is explosive when it is dried, and should not be distilled!]*

What type of still is best for you?

1. Is the capacity of the distillation unit adequate for your needs?
2. Is the boiling point of your solvent within the designed temperature range for the still or will you need to distill at reduced pressure?
3. Does the still operate on a batch or a continuous basis?
4. Will the waste solvent need to be treated to remove solids before it is fed to the still? *[A high solids content may foul some types of equipment.]*
5. Will the materials used in the construction of the still *[e.g. stainless steel, teflon, etc.]* resist deterioration from the solvent the still will process?
6. Are the still bottoms to be removed automatically or manually?
7. Is the still heated by an electric element, hot oil, or steam? *[The best method of heating should be evaluated with respect to both safety and cost effectiveness.]*
8. Is the solvent vapor cooled and condensed by chemical coolant, water, or forced air? *[Some solvent vapors are cooled more efficiently by water and coolant as opposed to air.]*
9. Will fractioning columns be necessary to separate components of the condensing vapor? *[Fractioning columns help to separate components that have relatively close boiling points.]*

Other considerations

1. Will the manufacturer demonstrate the efficiency of the still by distilling a sample of your waste?
2. Are the safety features of the still sufficient for the work environment at your facility?
    - Are the electrical switches and controls explosion proof?
    - Can the unit be secured to prevent it from being opened until it has cooled to a safe temperature?
    - Is the unit designed to shut down safely if the maximum operating temperature or pressure is exceeded?
    - Will the unit shut down safely if there is a failure in the water or electrical utility supply?
3. What is the anticipated volume of still bottoms that you expect to generate and what are the associated costs of disposal? *[Still bottoms are considered a hazardous waste.]*
4. Will the still require a modification of the ventilation system at your facility? *[Solvent recovery hoods may be installed to collect fugitive emissions.]*
5. Will the operation of the still affect your compliance with local, state, or federal environmental or health and safety regulations?
6. What are the energy requirements for the still? Is it energy efficient?

Some of the purchasing guidelines have been adapted from a Minnesota Technical Assistance Program (MnTAP) fact sheet on On-Site Solvent Recovery Stills. The DNR would like to thank MnTAP for its contribution.

On-Site Solvent Recovery Stills Manufacturer and Supplier List August 1991

The Wisconsin Department of Natural Resources (DNR), through the Wisconsin Hazardous Waste Minimization Technical Assistance Program, developed the following list of manufacturers and suppliers of solvent distillation equipment. The list should not be considered to be complete in its listing of manufacturers or suppliers. This list is not an endorsement of any of the specific manufacturers or suppliers. Hazardous waste generators are advised to thoroughly evaluate the services and compliance status of any company that they use to manage their hazardous waste. The list will be periodically updated. If you have any additions or corrections for this list, please contact the Hazardous Waste Minimization Technical Assistance Program at (608) 267-3763.

Manufacturer	**Distributor/Sales Rep.**
Acra Electric Corp.	**C&H Supply**

3801 N. 25th Avenue Schiller Park, Il 60176 Phone: (708) 678-8870 Fax: (708) 678-8889	400 S. 5th Street Milwaukee, WI
Artisan Products 73 Pond Street Waltham, MA 02254 Phone: (617) 893-6800 Fax: (617) 647-0143	**White Cleaning Equipment** P.O. Box 1073 Waukesha, WI 53187 Phone: (414) 521-3152 Attn: Dave Pagor
Baron-Blakeslee/Allied Signal 2001 N. Janice Avenue Melrose Park, IL 60160 Phone: (708) 450-3900 Fax: (708) 450-3884 Attn: Bob Block	**Bob Block** Phone: (708) 450-3900
B/R Instrument Corp. P.O. Box 7 Pasadena, MD 21121 Phone: (612) 452-5695 (800) 922-9206	**Ann Cole** 12861 Hamlet Ave. Apple Valley, MN 55124 Phone: (612)
Branson Ultrasonic 41 Egale Road Danbury, CT 06813 Phone: (203) 796-0400	**Schuette Ind. Sales** P.O. Box 943 Waukesha, WI 53187 Attn: Tom Riddle Phone: (414) 549-0050
Brighton Corporation 11861 Mosteller Road Cincinnati, OH 45241 Phone: (513) 771-2300 Fax: (513) 772-2404 Attn: Ken Lutz	**Fred Hickey Corp.** 9601 River Street Schiller Park, IL 60176 Phone: (708) 678-2777
Crest Ultrasonics Corp. Scotch Road, Mercer County Airport Trenton, NJ 08628 Phone: (609) 883-4000 Fax: (609) 883-6452	**David Arata** 525 Westin Street Hoffman Estates, IL 61094 Phone: (708) 843-2139
DCI International 1229 Country Club Road Indianapolis, IN 46234 Phone: (317) 271-4001 Fax: (317) 271-1044	**Bob Zopf** Phone: (317) 271-4001
Detrex Corporation P.O. Box 5111 Southfield, MI 48086 Phone: (313) 358-5800 Fax: (313) 358-5803	
Finish Engineering Co. 921 Greengarden Road	**Dove Equipment Co.** 4831 Colt Rd.

Erie, PA 16501-1591 Phone: (814) 455-4478	Rockford, IL 61109 Phone: (815) 87-8900 **Recovery Equipment Corp.** P.O. Box 75 Mequon, WI 53092 Phone: (414) 242-9410
Gardner Machinery Co. P.O. Box 33818 Charlotte, NC 38233 Phone: (704) 372-3890 Fax: (704) 342-0758 Attn: Pat Russell	**Pat Russell** Phone: (704) 372-3890
Giant Distillation and Recovery 900 N. Westwood Avenue Toledo, OH 43606 Phone: (414) 531-4600	**Wisconsin Compressed Air** 3056 W. Meinecke Avenue Milwaukee, WI 53210 Phone: (414) 442-0280
Hoffman/Clarkson Ind. P.O. Box 548 East Syracuse, NY 13057-0548 Phone: (315) 437-0311 Attn: Earl Stone	**Earl Stone** Phone: (315) 437-0311
Hoyt Corporation 251 Forge Road Westport, MA 02790 Phone: (508) 636-8811 Fax: (508) 636-2088	**Michael Morely** Rt. #3, Box 217 Slatington, PA 18080 Phone: (215) 767-7622
Interel Corp. P.O. Box 4676 Englewood, CO 80155 Phone: (303) 773-0753	
Kontes Scientific Glassware/Instruments P.O. Box 729 Vineland, NJ 08360 Phone: (609) 692-8500 Fax: (609) 692-3242	**Cynthia Halstead** 259 Mary Street Winnetka, IL 60093 Phone: (708) 835-3392
Lenan Corporation 615 North Parker St. Janesville, WI 53545 Phone: (800) 356-9424 In Wi (608) 752-1601	**Energy Sales Products** 515 St. Lawrence Avenue Janesville, WI 53545 Phone: (608) 752-0195
Luwa Corporation Process Division P.O. Box 16348 Charlotte, NC 28297 Phone: (704) 394-8341 Fax: (704) 392-8507	**Ralph Scully** 2407 Worthing Drive Suite 101 Naperville, IL Phone: (708) 305-8693
O-I/Schott Process Systems	**Liquiflow, Inc.**

1640 Southwest Blvd. Vineland, NJ 08360 Phone: (609) 692-4700 Fax: (609) 692-5619 Attn: John Jaworski	1201 National Ave. Addison, IL 60101 Phone: (708) 543-4080 Attn: Mitch Brach
PBR Industries 400 Farmingdale Road West Babylon, NY 11704 Phone: (516) 422-0057	**Quality Auto Body Supply** 129 Vine Street La Crosse, WI 54601 Phone: (608) 782-4552
Phaudler Company 100 West Avenue Rochester, NY 14692 Phone: (716) 235-1000 Fax: (716) 423-9644	**Mark Cody** Phone: (708) 244-8363 or **Todd Pollack** Phone: (313) 739-4311
Progressive Recovery 1976 Congressinal Dr. St. Louis, MO 63146 Phone: (314) 567-7963 Attn: Joe Miller	**Midwest Environmental** N88 W16751 Appleton Ave. Menomonee Falls, WI 53051 Phone: (414) 253-2299 Attn: Mike Kleinhans
Renzmann, Inc. Max Detweiler Corp. 13420 Reese St., West Huntersville, NC 28078 Phone: (704) 875-1200	**Arthur Collier** 13420 Reese St. West Huntersville, NC 28078 Phone: (416) 433-0363
Siva International Recyclene/Disti 405 Eccles Avenue South San Francisco, CA 94080 Phone: (415) 589-9600	**Waste-Tech, Inc.** 1931 Industrial Drive Libertyville, IL 60048 Phone: (708) 367-5150 Fax: (708) 367-1787
Unique Industries P.O. Box C4530 Pacoima, CA 91333-4530 Phone: (818) 890-1133	**Phoenix-Erin** 487 Willsher Drive Fond du Lac, WI 54935 Attn: Don White Phone: (414) 922-2936
Venus Products 1862 Ives Avenue Kent, WA 98032 Phone: (206) 854-2660	**Northwest Fiberglass** 3055 Columbia Ave. NE Minneapolis, MN 55418 Phone: (800) 544-1388